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COUNTY OF LOS ANGELES  
DEPARTMENT OF HEALTH SERVICES

# Varicella Surveillance Project

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## ANNUAL SUMMARY January 1 - December 31, 1998

### I. METHODOLOGY

#### Summary of Methodology

The varicella active surveillance project (VSP) conducts active surveillance for varicella among the 303,000 residents (according to the 1990 census) of the Antelope Valley Health Services District of the Los Angeles County Department of Health Services. The project collects case reports of varicella from 311 surveillance units, representing 100% sampling of the total Antelope Valley population. Surveillance units include all public and private schools and day care centers with enrollments of 12 or more children; private physicians, public health clinics, hospitals, primary care physicians, and health maintenance organization (HMO) offices; employers with 500 or more employees; correctional facilities; and miscellaneous others likely to identify and report cases of varicella. A case of varicella is defined as illness with acute onset of a diffuse papulovesicular rash without other known cause. Case reports and data regarding vaccine administration are collected every two weeks. A structured telephone interview is conducted with each case or parent/guardian to collect detailed demographic, clinical, and health impact data and to determine if there are additional cases or susceptible contacts within the household. Susceptible household contacts are reinterviewed four to six weeks after the initial contact to identify additional cases. Data are entered into a Turbo Pascal-based database designed by project staff. Data collection began January 1, 1995.

The population figures for 1995, 1996 and 1997 used to calculate rates were obtained from the corresponding yearly population estimations of the Regional Population Model (RPM) file developed by the County of Los Angeles Urban Research Section of the Internal Services Department (Attachment 1). Rates for 1998 were based on the 1997 population estimates as a more current estimate was unavailable at the time of this report. These population estimates were projected from the 1990 MARS file (Modified Age, Race, and Sex), produced by the US Census Bureau and modified by local death rates, migration rates and fertility rates within age, sex and racial/ethnic groups.

## Reporting Sources

A total of 280 reporting sites representing 311 surveillance units are currently participating (Table 1). Varicella cases are also identified through household interviews and occasionally through sites outside those specifically under active surveillance. Fluctuation in the number of surveillance units by type are primarily related to schools, day care centers or medical facilities opening, consolidating, or closing. No sites have refused further participation in the project. With prompting, reporting site compliance in submitting case logs every two weeks to the VSP office is 100%.

**Table 1. Number and Type of Participating Surveillance Units by Year, VSP, 1995 - 1998**

<b>Surveillance Unit by Type</b>	<b>1995 N (%)</b>	<b>1996 N (%)</b>	<b>1997 N (%)</b>	<b>1998 N (%)</b>
Elementary and Highschools	93 (32.7)	92 (31.8)	98 (32.1)	102 (32.9)
Preschool/Day Cares	49 (17.2)*	63 (21.8)	72 (23.6)	75 (24.1)
Private Practice MDs	89 (31.3)	85 (29.4)	87 (28.6)	85 (27.6)
HMO Offices	7 (2.5)	16 (5.5)	19 (6.2)	18 (5.5)
Hospitals	4 (1.4)	3 (1.0)	3 (1.0)	3 (1.0)
Public Health Clinics	12 (4.2)	12 (4.1)	8 (2.6)	9 (2.9)
Correctional Facilities	3 (1.0)	3 (1.0)	3 (1.0)	3 (1.0)
Large Employers	11 (3.9)	10 (3.4)	10 (3.3)	11 (3.3)
Miscellaneous	14 (4.9*)	3 (1.0)	3 (1.0)	3 (1.0)
Households	1 (0.4)	1 (0.3)	1 (0.3)	1 (0.3)
Outside Normal Sampling	1 (0.4)	1 (0.3)	1 (0.3)	1 (0.3)
<b>Total</b>	<b>284 (100)</b>	<b>289 (100)</b>	<b>305 (100)</b>	<b>311 (100)</b>

## II. REPORTED CASES

Between January 1 and December 31, 1998, surveillance units reported 2,005 persons with varicella; 100 (5%) were excluded when case interviews revealed that illness or school absence was not due to varicella. Of the remaining 1,905 presumptive cases, 1,785 (94%) were verified by telephone interview and collection of clinical data completed, 120 (6%) were unreachable by telephone or declined to be interviewed and were considered probable cases and none are pending collection of clinical data (Table 2). The number of verified cases decreased 19.6% in 1998 compared with 1997; cases have decreased 39.2% since data collection began in 1995.

During the four-year project period to date (1995-1998), a total of 10,389 persons with varicella were reported by surveillance units; 417 (4%) were excluded when case interviews revealed that illness or school absence was not due to varicella. Of the remaining 9,972 presumptive cases, 9,359 (94%) were verified by telephone interview resulting in the collection of clinical data, and 613 (6%) were unreachable by telephone or declined to be interviewed and were considered probable cases (Table 2). In this report, analysis is limited to verified cases unless otherwise specified.

**Table 2. Status of Reported Varicella Cases by Year, VSP, 1995 - 1998 and Combined Years**

<b>Case Status</b>	<b>1995 N (%)</b>	<b>1996 N (%)</b>	<b>1997 N (%)</b>	<b>1998 N (%)</b>	<b>1995-1998 N (%)</b>
Verified	2,934 (91.7)	2,421 (89.8)	2,219 (89.2)	1,785 (89.0)	9,359 (90.0)
Probable	166 (5.2)	189 (7.0)	138 (5.5)	120 (6.0)	613 (5.9)
Excluded	101 (3.2)	86 (3.2)	130 (5.2)	100 (5.0)	417 (4.0)
Pending	0	0	0	0	0
<b>Total Reported</b>	<b>3,201 (100)</b>	<b>2,696 (100)</b>	<b>2,487 (100)</b>	<b>2,005 (100)</b>	<b>10,389 (100)</b>

### III. SOURCE OF REPORT

In 1998, as in the previous three years, the most common source of case reports was schools (882; 42%), followed by household interviews (536 ;26%) and healthcare providers (419; 20%), including private practice physicians, HMO offices, hospitals and public health clinics (Table 3). The distribution of cases by reporting source has not varied significantly over the four-year study period.

**Table 3. Source of Varicella Case Reports\* by Year, VSP, 1995 - 1998**

Source of Report	1995 N (%)	1996 N (%)	1997 N (%)	1998 N (%)	1995-1998 N (%)
Elementary and High Schools	1,134 (33.8)	1,108 (39.7)	967 (36.3)	882 (42.3)	4091 (37.6)
Preschools/Day Cares	432 (12.9)	277 (9.9)	233 (8.7)	150 (7.2)	1092 (10.0)
Health Care Providers	757 (22.6)	494 (17.7)	650 (24.4)	419 (20.1)	2320 (21.3)
Private Practice MDs	282 (8.4)	200 (7.2)	243 (9.1)	168 (8.0)	893 (8.2)
HMO Offices	240 (7.2)	102 (3.6)	227 (8.5)	144 (6.9)	713 (6.5)
Hospitals	132 (3.9)	144 (5.2)	112 (4.2)	71 (3.4)	459 (4.2)
PublicHealth Clinics	103 (3.0)	49 (1.7)	68 (2.6)	36 (1.7)	256 (2.3)
Correctional Facilities	0 (0)	3 (0.1)	6 (0.2)	24 (1.1)	33 (0.2)
Large Employers	10 (0.3)	0 (0)	3 (0.1)	10 (0.5)	23 (0.2)
Miscellaneous	53 (1.6)	63 (2.3)	68 (2.6)	51 (2.4)	235 (2.1)
Households	924 (27.6)	811 (29.0)	718 (26.9)	536 (25.7)	2989 (27.6)
Outside Normal Sampling	41 (1.2)	35 (1.3)	20 (0.8)	15 (0.7)	111 (1.0)
<b>TOTAL</b>	<b>3,351 (100)</b>	<b>2,791 (100)</b>	<b>2,665 (100)</b>	<b>2087 (100)</b>	<b>10,894 (100)</b>

\* Includes verified and probable cases. Cases reported by more than one surveillance unit are included.

## Source of Report by Age Group

In 1998, five- to-eighteen-year-olds were primarily reported by schools as expected; all other age groups were primarily reported by households, followed by healthcare providers (Table 4). Sources of report by age group for 1995, 1996 and 1997 can be found in Attachment 2.

**Table 4. Source of Varicella Case Report by Age Group, VSP, 1998**

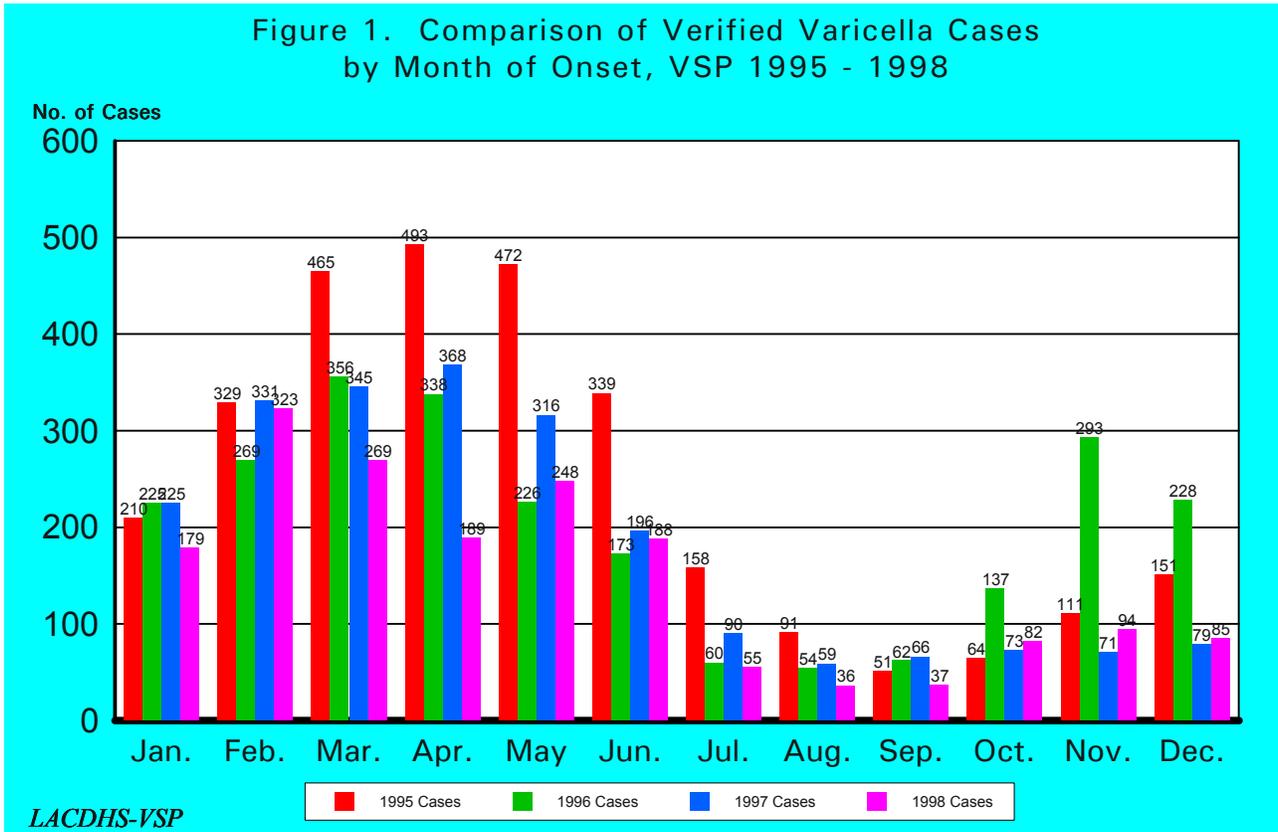
Source of Varicella Case Report	Age Group (Years) N (%)					
	<1	1-4	5-9	10-14	15-19	>19
Elementary /HighSchools	2 (2.4)	18 (3.5)	707 (63.8)	131 (62.4)	23 (36.5)	1 (0.9)
Preschools/Day Cares	1 (1.2)	96 (18.8)	51 (4.6)	2 (1.0)	-----	-----
Healthcare Providers	27 (32.9)	110 (21.5)	191 (17.2)	37 (17.6)	11 (17.5)	43 (38.4)
Private Practice MDs	8 (9.8)	45 (8.8)	87 (7.9)	12 (5.7)	2 (3.2)	14 (12.5)
HMO Offices	5 (6.1)	33 (6.4)	69 (6.2)	13 (6.2)	7 (11.1)	17 (15.2)
Hospitals	10 (12.2)	18 (3.5)	23 (2.1)	8 (3.8)	2 (3.2)	10 (8.9)
Public Health Clinics	4 (4.9)	14 (2.7)	12 (1.1)	4 (1.9)	0 (0)	2(1.8)
Correctional Facilities	-----	-----	-----	5 (2.4)	19 (30.2)	-----
Large Employers	1 (1.2)	-----	1 (0.1)	-----	-----	8 (7.1)
Miscellaneous	7 (8.5)	29 (5.7)	11 (1.0)	2 (1.0)	-----	2 (1.8)
Households	40 (48.8)	254 (49.6)	145 (13.1)	31 (14.8)	10 (15.9)	56 (50.0)
Outside Normal Samp.	4 (4.9)	5 (1.0)	2 (0.2)	2 (1.0)	-----	2 (1.8)
<b>Total</b>	<b>82 (100)</b>	<b>512 (100)</b>	<b>1,108 (100)</b>	<b>210 (100)</b>	<b>63 (100)</b>	<b>112 (100)</b>

\* Includes verified and probable cases. Cases reported by more than one surveillance unit are included.

### III. SURVEILLANCE DATA

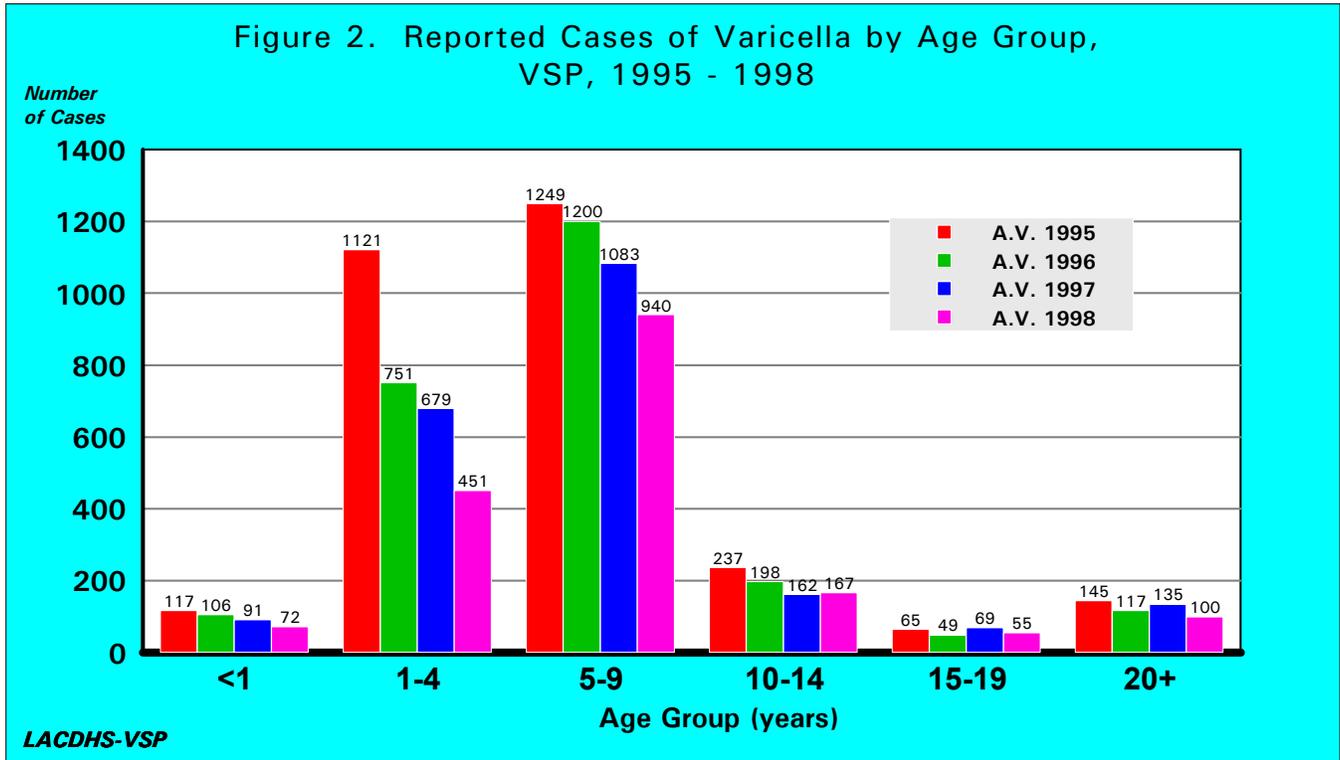
#### Seasonal Trend

The pronounced late winter-early spring seasonality was again apparent in 1998 (Figure 1).



## Age Distribution/Incidence

In 1995 the largest number (1,249) of reported cases was in the five- to nine-year-old age group, closely followed by the one- to four-year-old age group (1,121; Figure 2); whereas, in 1998 the one- to four-year-old age group reported less than half the cases (451) reported by the five- to nine-year-old age group (940).

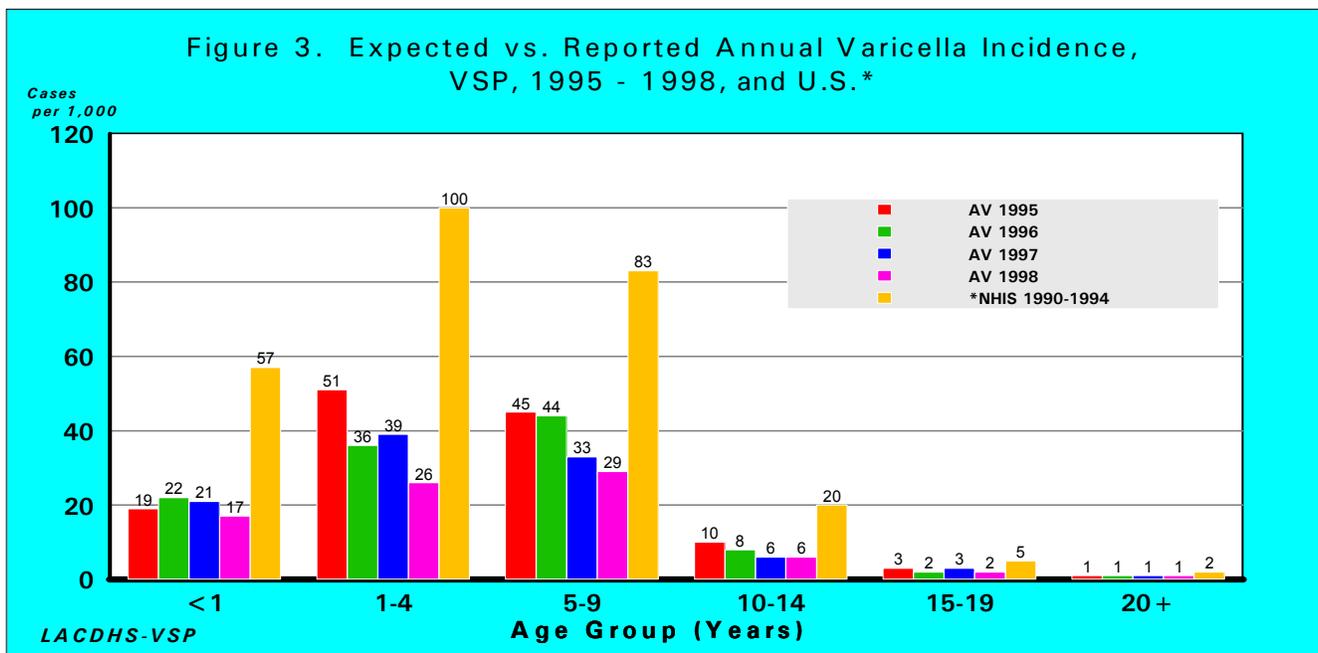


The average age of a case is one year older in 1998 (8.0) than in 1995 (7.1). The proportion of cases in one- to four-year-olds has decreased each year (Table 5).

**Table 5. Reported Cases and Incidence Rates of Varicella per 1,000 Population by Age Group, VSP, 1995 - 1998**

Age Group (years)	1995		1996		1997		1998	
	N (%)	/1,000	N (%)	/1,000	N (%)	/1,000	N (%)	/1,000
<1	117 (4)	19.2	106 (4.4)	22.2	91 (4.1)	21.1	72 (4.0)	16.7
1-4	1,121 (38.2)	51.0	751 (31.0)	35.7	679 (30.6)	39.1	451 (25.3)	26.0
5-9	1,249 (42.6)	44.6	1,200 (49.6)	43.8	1,083 (48.8)	33.3	940 (52.7)	28.9
10-14	237 (8.1)	9.5	198 (8.2)	7.9	162 (7.3)	6.1	167 (9.4)	6.3
15-19	65 (2.2)	3.2	49 (2.0)	2.3	69 (3.1)	2.9	55 (3.1)	2.3
20+	145 (4.9)	0.7	117 (4.8)	0.7	135 (6.1)	0.7	100 (5.6)	0.5
<b>Total</b>	<b>2,934 (100)</b>	<b>9.7</b>	<b>2,421 (100)</b>	<b>8.9</b>	<b>2,219 (100)</b>	<b>7.4</b>	<b>1785 (100)</b>	<b>6.0</b>
Avg. Age	7.1		7.1		7.7		8.0	
Age Range	<1 - 68		<1 - 66		<1 - 86		1 - 71	

In 1998, peak incidence occurred among five- to nine-year-olds (29 per 1,000 population), followed by one- to four-year-olds (26 cases per 1,000), and children less- than-one-year-old (17 per 1,000). The 1998 incidence rate in one- to four-year-olds is roughly half the 1995 rate for the same age group (Figure 3).



## Race/Ethnicity

Age-adjusted incidence rates of varicella among Blacks were nearly twice those among Hispanics and nearly three times those among Whites (Table 6).

**Table 6. Reported Cases of Varicella and Age-Adjusted Incidence Rates per 1,000 Population by Race/Ethnicity, VSP, 1995 - 1998**

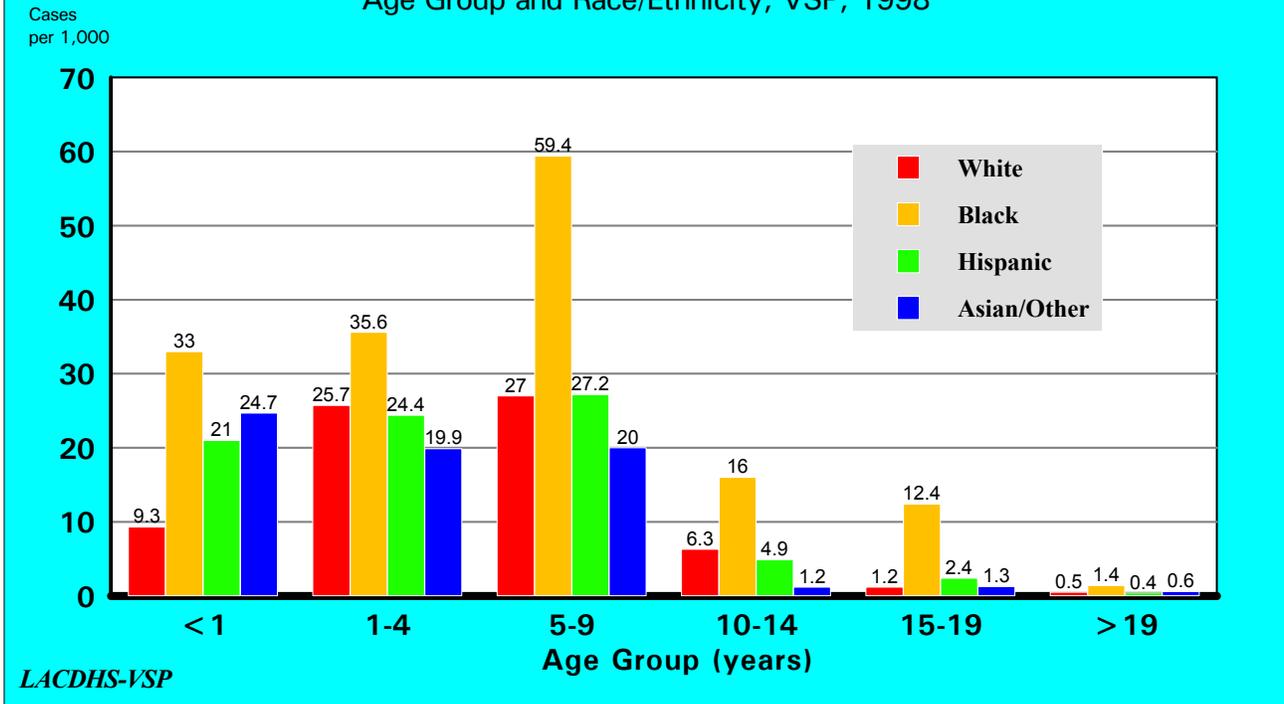
Race/ Ethnicity	1995		1996		1997		1998	
	N (%)	/1,000						
White	1,617 (55.1)	7.8	1,160 (47.9)	6.5	1,024 (46.1)	5.5	897 (50.3)	4.8
Black	325 (11.1)	16.5	383 (15.8)	23.6	366 (16.5)	18.1	279 (15.6)	13.8
Hispanic	861 (29.3)	13.4	761 (31.4)	11.8	752 (33.9)	10.1	537 (30.1)	7.2
Asian/Other	131 (4.5)	9.7	117 (4.8)	8.3	76 (3.4)	4.1	72 (4.0)	3.9
<b>Total</b>	<b>2,934 (100)</b>	<b>9.7</b>	<b>2,421 (100)</b>	<b>8.9</b>	<b>2,218 (100)</b>	<b>7.4</b>	<b>1,785 (100)</b>	<b>6.0</b>

Black children five-to nine-years-old experienced the highest incidence rates of any racial/ethnic group (59.4 cases per 1,000 population; Table 7; Figure 4). This incidence rate dropped from 85.2 cases per 1,000 in 1997.

**Table 7. Varicella Distribution and Incidence Rates per 1,000 Population by Age Group and Race/Ethnicity, VSP, 1998**

	White		Black		Hispanic		Asian/Other	
	N (%)	Rate	N (%)	Rate	N (%)	Rate	N (%)	Rate
<1	20 (2.2)	9.3	15 (5.4)	33.0	31 (5.8)	21.0	6 (8.3)	24.7
1-4	220 (24.5)	25.7	66 (23.7)	35.6	145 (27.0)	24.4	20 (27.8)	19.9
5-9	492 (54.8)	27.0	129 (46.2)	59.4	284 (52.9)	27.2	35 (48.6)	20.0
10-14	90 (10.0)	6.3	32 (11.5)	16.0	43 (8.0)	4.9	2 (2.8)	1.2
15-19	17 (1.9)	1.2	20 (7.2)	12.4	16 (3.0)	2.4	2 (2.8)	1.3
>19	58 (6.5)	0.5	17 (6.1)	1.4	18 (3.4)	0.4	7 (9.7)	0.6
<b>Total</b>	<b>897 (100)</b>	<b>4.8</b>	<b>279 (100)</b>	<b>13.8</b>	<b>537 (100)</b>	<b>7.2</b>	<b>72 (100)</b>	<b>3.9</b>

Figure 4. Incidence Rates (cases per 1000 population) by Age Group and Race/Ethnicity, VSP, 1998



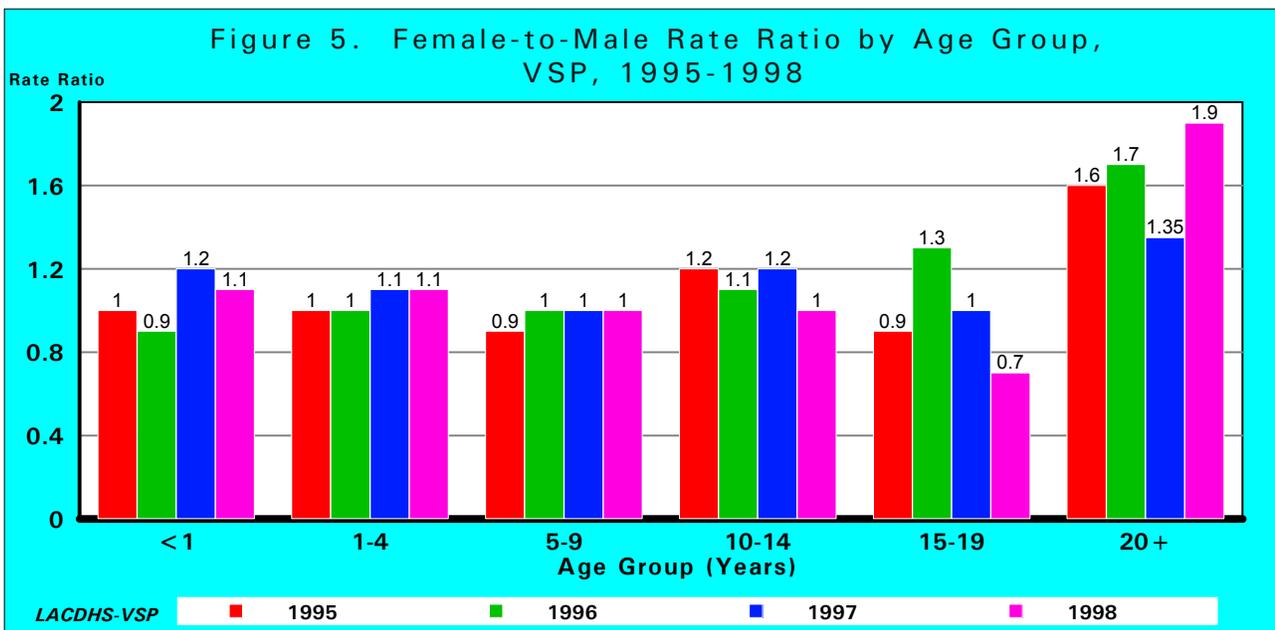
The finding of higher than anticipated incidence rates of varicella among Blacks may be an artifact of inaccurate midcensus population estimates for the Antelope Valley: Data from the California Basic Educational Data System (CBEDS) suggest that the number of school-age Black students in the Antelope Valley is substantially higher than estimations projected from the 1990 MARS file for the Antelope Valley Health District (Attachment 3).

## Gender

Females and males were generally affected equally for each age group with a female-to-male case ratio and rate ratio of nearly 1.00 in 1998; for the 20 and older age group, however, females outnumbered males 1.86:1 based on a case ratio and 1.83:1 based on a rate ratio (Table 8; Figure 5). This may result from greater exposure opportunity among adult females as primary caregivers of children with varicella.

**Table 8. Reported Varicella Cases by Age and Gender, VSP, 1997 and 1998**

Age Group (years)	1997 N (%)			1998 N (%)		
	Female	Male	Female:Male Case Ratio	Female	Male	Female:Male Case Ratio
<1	48 (4.2)	43 (3.9)	1.12	37 (4.0)	35 (4.0)	1.05
1-4	346 (30.8)	333 (30.3)	1.04	232 (25.6)	219 (24.9)	1.05
5-9	532 (47.4)	551 (50.2)	0.97	467 (51.5)	473 (53.8)	0.99
10-14	85 (7.6)	77 (7.0)	1.10	83 (9.2)	84 (9.6)	0.99
15-19	33 (2.9)	36 (3.2)	0.92	22 (2.4)	33 (3.7)	0.66
20+	78 (6.9)	57 (5.1)	1.37	65 (7.1)	35 (4.0)	1.86
<b>Total</b>	<b>1,122 (100)</b>	<b>1,097 (100)</b>	<b>1.02</b>	<b>906 (100)</b>	<b>879 (100)</b>	<b>1.03</b>



## Grading of Lesion Severity

Beginning January 1, 1997, along with the two other project sites, we modified the definition of lesion grading from “mild” (<50), “moderate” (50-250) and “severe” (>250) to “less-than-average” (<50), “average” (50-500) and “more-than-average” (>500). The definition of <50 lesions for “mild” cases in 1995 and 1996 changed only in name to “less-than-average” in 1997 (Attachment 4). Thus, this category has remained consistent from 1995 to 1998. The number of cases with more-than-average lesion grading is understandably lower in 1997 and 1998 when compared to the severe lesion grading in 1995 and 1996 since this definition changed from >250 to >500 lesions in 1997 (Table 9).

**Table 9. Grading of Varicella Lesion Severity by Year, VSP, 1995 - 1998**

Grading of Lesions	1995 N (%)	1996 N (%)	New Definition	1997 N (%)	1998 N (%)
Mild	1,035 (35.3)	935 (38.6)	< average	804 (36.2)	665 (36.7)
Moderate	1,341 (45.7)	1,034 (42.7)	average	1,212 (54.6)	974 (54.6)
Severe	558 (19.0)	452 (18.7)	> average	203 (9.1)	156 (8.7)
<b>Total</b>	<b>2,934 (100)</b>	<b>2,421 (100)</b>		<b>2,219 (100)</b>	<b>1,785 (100)</b>

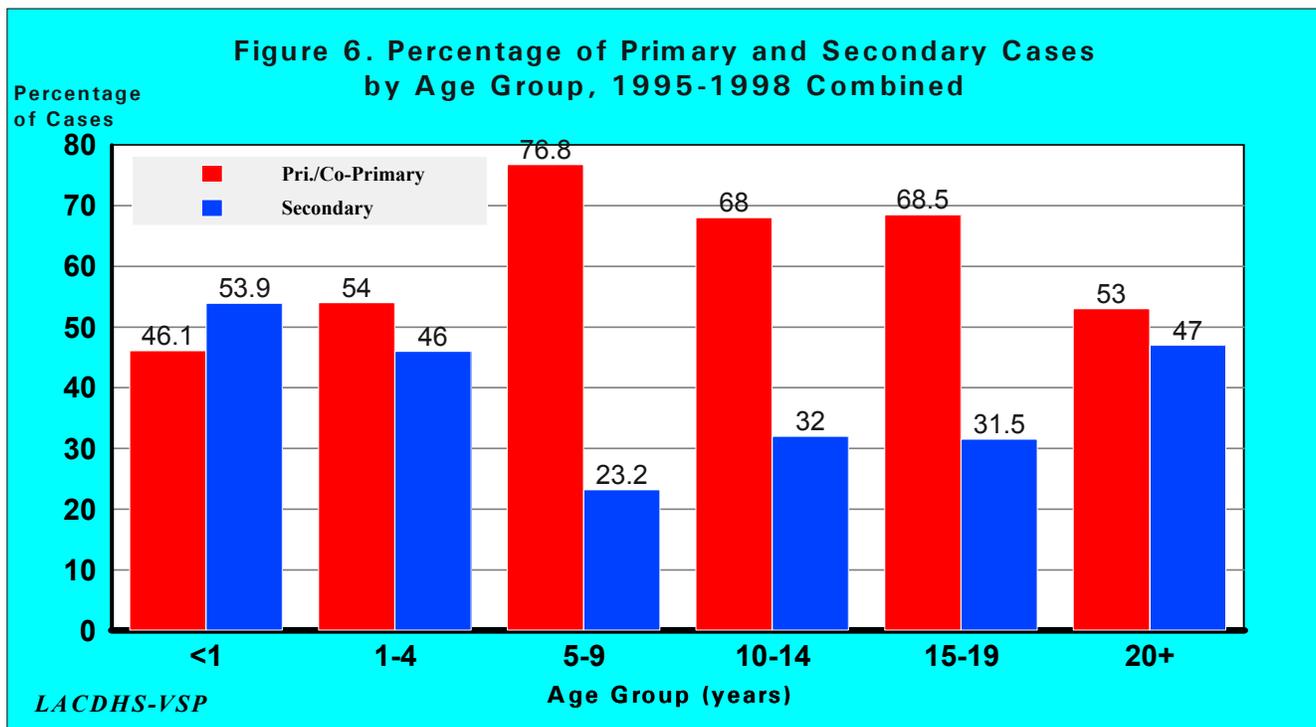
In general, lesion severity tended to be mild or moderate (average or less-than-average number of lesions) for the vast majority of cases; however, late adolescents, fifteen- to nineteen-years-old, and adults were more likely than other age groups to report severe or more-than-average number of varicella pox lesions when we consider combined years, 1995-1998 (Table 10).

**Table 10. Grading of Varicella Lesions by Age Group, VSP, 1995 - 1998 and Combined Years**

Lesion Grading	1995					
	<1 N=117	1 - 4 N=1,121	5 - 9 N=1,249	10 - 14 N=237	15-19 N=65	>19 N=145
Mild	38 (32.4)	416 (37.1)	444(3.5)	85 (35.9)	12 (18.5)	40 (27.6)
Moderate	49 (41.8)	497 (44.3)	605 (48.4)	99 (41.7)	37 (56.9)	54 (37.2)
Severe	30 (25.6)	208 (18.5)	200 (16.0)	53 (22.3)	16 (24.6)	51 (35.1)
Lesion Grading	1996					
	<1 N=106	1 - 4 N=751	5 - 9 N=1,200	10 - 14 N=198	15-19 N=49	>19 N=117
Mild	47 (44.3)	279 (33.1)	491 (40.9)	70 (35.3)	13 (26.5)	35 (29.9)
Moderate	39 (36.7)	328 (43.6)	518 (43.1)	88 (44.4)	20 (40.8)	41 (35.0)
Severe	20 (18.9)	144 (19.1)	191 (15.9)	40 (20.2)	16 (32.6)	41 (35.0)
Lesion Grading	1997					
	<1 N=91	1 - 4 N=679	5 - 9 N=1,083	10 - 14 N=162	15-19 N=69	>19 N=135
< Average	40 (43.9)	254 (37.4)	403 (37.2)	50 (30.8)	18 (26.0)	39 (28.8)
Average	44 (48.3)	375 (55.2)	602 (55.6)	90 (55.5)	38 (55.0)	63 (46.6)
> Average	7 (7.6)	50 (7.3)	78 (7.2)	22 (13.5)	13 (18.8)	33 (24.4)
Lesion Grading	1998					
	<1 N=72	1-4 N=451	5-9 N=940	10-14 N=167	15-19 N=55	>19 N=100
< Average	34 (47.2)	191 (42.3)	352 (37.4)	42 (25.1)	7 (12.7)	29 (29.0)
Average	33 (45.8)	226 (50.1)	520 (55.3)	108 (64.7)	38 (69.0)	49 (49.0)
> Average	5 (6.9)	34 (7.5)	68 (7.2)	17 (10.1)	10 (18.1)	22 (22.0)
Lesion Grading	COMBINED YEARS 1995 - 1998					
	<1 N=386	1-4 N=3,002	5-9 N=4,472	10-14 N=764	15-19 N=238	>19 N=497
< Average	159 (41.2)	1,140 (38.0)	1,690 (37.8)	247 (32.3)	50 (21.0)	143 (28.8)
Average	165 (42.7)	1,426 (47.5)	2,245 (50.2)	385 (50.3)	133 (55.9)	207 (41.6)
> Average	62 (16.0)	436 (14.5)	537 (12.0)	132 (17.3)	55 (23.1)	147 (29.6)

## Household Clusters

We defined a primary case of varicella as the first case or only case of varicella that occurred within a household, a co-primary case as a case occurring within ten days of the primary case, and a secondary case as a case occurring ten days or more after a primary case. Five- to nine-year-olds made up the largest number of primary cases while the less-than-four-year-olds made up the largest number of secondary cases (Figure 6). School age children appear to bring varicella home to their younger siblings and older susceptible parents.



Secondary cases were more likely to have severe or more-than-average number of varicella lesions than primary cases ( $\chi^2=233$ ,  $p<0.005$ ). (Table 11).

**Table 11. Varicella Lesion Severity and Order of Illness Onset Within Households, VSP, 1995 - 1998 Combined**

Estimated Number of Pox Lesions	Order of Illness Onset	
	Primary/Co-primary <sup>2</sup> N (%)	Secondary N (%)
Mild or < Average	2,562 (41.5)	885 (28.0)
Moderate or Average	2,965 (48.0)	1,572 (49.8)
Severe or > Average	644 (10.4)	700 (22.2)
<b>Total</b>	<b>6,171 <sup>1</sup> (100)</b>	<b>3,157 <sup>1</sup> (100)</b>

<sup>1</sup>Varies from total verified cases since household cases continuing into the next year were grouped with the index case in the previous year.

<sup>2</sup> When considering Co-primary cases only (defined as one to ten days after first case in household), an interesting finding was 267 (37.6%) had less-than-average lesions, 301 (42.5%) had average lesions, and 140 (19.9%) had more-than-average lesions.

### Severity of Disease Index

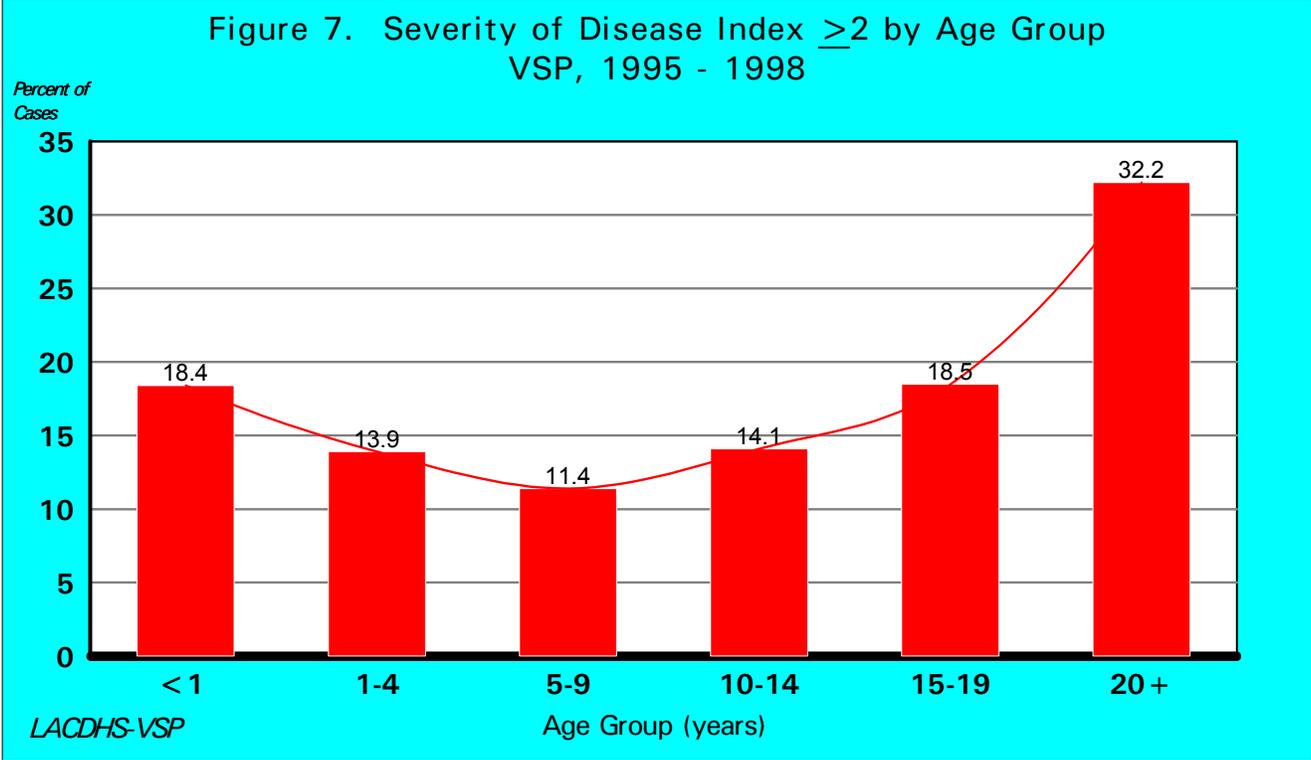
Severity of Disease Index definitions can be found in Attachment 5. There were ten cases in 1998 with a severity of disease index greater than two compared with 21 cases in this range during 1997 (Table 12).

**Table 12. Severity of Disease Index by Year, VSP, 1995 - 1998**

Severity of Disease Index	1995 N (%)	1996 N (%)	1997 N (%)	1998 N (%)
Index 1	2,467 (84.1)	2,108 (87.1)	1,919 (86.6)	1,550 (86.9)
Index 2	444 (15.1)	303 (12.5)	277 (12.5)	223 (12.5)
Index 3	17 (0.6)	3 (0.1)	5 (0.2)	4 (0.2)
Index 4	6 (0.2)	7 (0.3)	15 (0.7)	6 (0.3)
Index 5	0 (0)	0 (0)	1 (0.04)	0 (0)
<b>Total</b>	<b>2,934 (100)</b>	<b>2,421 (100)</b>	<b>2,217 <sup>1</sup> (100)</b>	<b>1,783 <sup>1</sup> (100)</b>

<sup>1</sup>This number differs from the 1785 verified cases for 1998 because data regarding complications were unavailable for two cases.

A severity of disease index 1 indicates mild, uncomplicated varicella. Young children and adults were more likely to have severe disease as indicated by a disease index of 2 or greater (Figure 7).



## Complications

We defined a complication as a self-reported condition or event for which the case-patient was evaluated and treated by a health care provider and which occurred within two weeks of the onset of varicella disease. Self-reports of complications were confirmed for hospitalized cases only. Of the 1,785 verified cases in 1998, 191 (11%) cases reported 240 complications (Table 13). This compares with 13% of cases reporting complications in 1995, 8% in 1996 and 10% in 1997 (Attachment 6). In 1998, adults experienced two to three times more healthcare provider diagnosed complications than any other age group ( $\chi^2=64$ ,  $p<0.001$ ).

**Table 13. Healthcare Provider-Diagnosed Complications by Age Group, VSP, 1998**

Complication	<1 N=72	1 - 4 N=451	5 - 9 N=940	10 - 14 N=167	15-19 N=55	>19 N=100
Infected Lesions	1 (1.4)	6 (1.3)	17 (1.8)	3 (1.8)	2 (3.6)	5 (5.0)
Infected Lesions with Strep	1 (1.4)	1 (0.2)	1 (0.1)	2 (1.2)	0	1 (1.0)
Conjunctivitis	0	2 (0.4)	6 (0.6)	0	0	0
Otitis Media	4 (5.6)	15 (3.3)	15 (1.6)	3 (1.8)	0	1 (1.0)
Pharyngitis	0	3 (0.7)	7 (0.7)	1 (0.6)	2 (3.6)	3 (3.0)
Pharyngitis with Strep		2 (0.4)	6 (0.6)	2 (1.2)	1 (1.8)	2 (2.0)
LRT Infection without antibiotics	0	0	1 (0.1)	1 (0.6)	0	1 (1.0)
LRT Inf. with antibiotics &/or O <sub>2</sub>	0	1 (0.2)	1 (0.1)	1 (0.6)	0	1 (1.0)
Cerebellitis-Cerebellar Ataxia	0	0	0	0	0	0
Severe Headache	1 (1.4)	1 (0.2)	18 (1.9)	4 (0.2)	1 (1.8)	14 (14.0)
Asthma exacerbation	1 (1.4)	5 (1.1)	4 (0.4)	0	0	2 (2.0)
URI	3 (4.2)	7 (1.6)	5 (0.5)	1 (0.6)	0	0
Encephalitis or Meningitis	0	0	1 (0.1)	0	0	0
Vomiting	0	1 (0.2)	4 (0.4)	2 (1.2)	0	2 (2.0)
Febrile Seizures	0	0	0	0	0	0
Allergic Reaction	0	0	1 (0.1)	0	0	0
Mental Status Changes	0	0	2 (0.2)	0	1 (1.8)	0
Diarrhea	1 (1.4)	1 (0.2)	0	1 (0.6)	0	0
UTI	0	0	3 (0.3)	0	0	0
Dehydration	1 (1.4)	1 (0.2)	2 (0.2)	0	0	1 (1.0)
Abdominal Abscess	0	0	0	1 (0.6)	0	0
Appendectomy	0	0	1 (0.1)	0	0	0
Misc	0	4 (0.9)	11 (1.2)	2 (1.2)	0	7 (7.0)
<b>Total</b>	<b>13 (18.0)</b>	<b>50 (11.0)</b>	<b>106 (11.3)</b>	<b>24 (14.4)</b>	<b>7 (12.7)</b>	<b>40 (40.0)</b>

In 1998, nine persons with varicella experienced a major complication (pneumonia, encephalitis, surgery; Table 14). Major complications in 1998 were 53% lower than those in 1997.

**Table 14. Major Complications by Age Group, VSP, 1998**

Complication	<1 N=72 n (%)	1 - 4 N=451 n (%)	5 - 9 N=940 n (%)	10 - 14 N=167 n (%)	15-19 N=55 n (%)	>19 N=100 n (%)
Pneumonia	0	1 (0.2)	1 (0.1)	1 (0.6)	0	2 (2.0)
New Onset Seizure Disorder	0	0	1 (0.1)	0	0	0
Surgery: Gp A Strep Soft Tissue Infection	0	0	0	1 (0.6)	0	0
Encephalitis	0	0	1 (0.1)	0	0	0
Surgery: Appendectomy	0	0	1 (0.1)	0	0	0
<b>Total</b>	<b>0</b>	<b>1 (0.2)</b>	<b>4 (0.4)</b>	<b>2 (1.2)</b>	<b>0</b>	<b>2 (2.0)</b>

### Vomiting and Diarrhea

For VSP surveillance, we defined the occurrence of diarrhea as three-or-more loose stools in a 24-hour period and the occurrence of vomiting as one-or-more episodes of emesis in a 24-hour period (Table 15). We began collecting information on vomiting and diarrhea beginning January 1, 1996. Gastrointestinal symptoms were reported by approximately 15.6% (279/1785) of cases.

**Table 15. Reported Occurrence of Vomiting and Diarrhea by Year, VSP, 1996 - 1998 and Combined Years**

Gastroenteric Symptoms	1996 N=2,421 n (%)	1997 N =2,219 n (%)	1998 N=1785 n (%)	1996-1998 N =6425 n (%)
Vomiting	202 (8.3)	158 (7.1)	177 (9.9)	537 (8.4)
Diarrhea	275 (11.4)	206 (9.3)	176 (9.9)	657 (10.2)
Both Vomiting & Diarrhea	85 (3.5)	67 (3.0)	74 (4.1)	226 (3.5)

## Temperature

In 1998, fever during varicella was reported by 1,216 (68%) cases, approximating the percentage for 1996 and 1997 (Table 16). Temperature was taken with a thermometer for 31% (547/1785) and tactilely for 37% (669/1785).

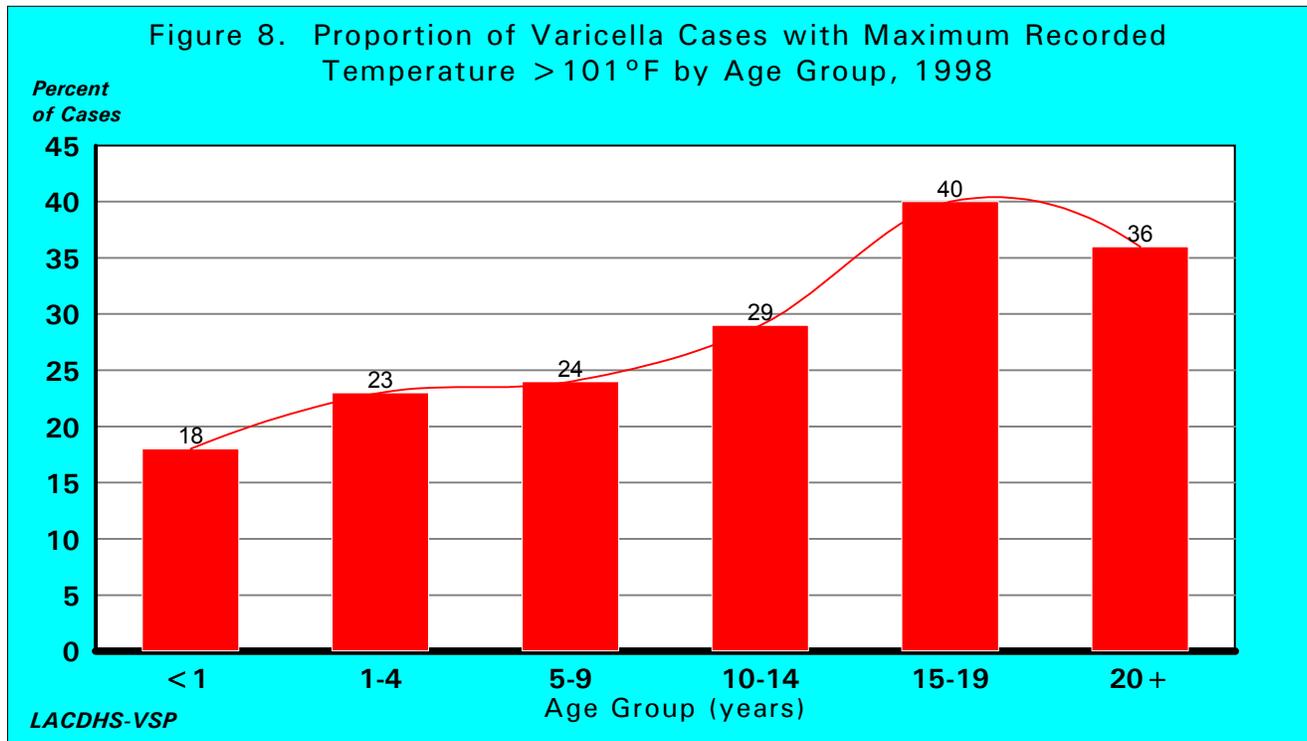
**Table 16. Maximum Recorded Temperature by Year, VSP, 1995 - 1998**

Maximum Recorded Temperature °F	1995 N=2,934 n (%)	1996 N=2,421 n (%)	1997 N=2,219 n (%)	1998 N=1,785 n (%)
No Fever	784 (26.7)	769 (31.7)	670 (30.2)	569 (31.9)
Fever	2,150 (73.3)	1,653 (68.3)	1,549 (69.8)	1,216 (68.1)
Fever determined tactilely	908 (30.9)	837 (34.6)	794 (35.8)	669 (37.5)
99.0 -100.0	194 (6.6)	140 (5.8)	126 (5.7)	97 (5.4)
101.0 - 102.9	632 (21.5)	450 (18.6)	403 (18.1)	302 (16.9)
103.0 - 104.9	379 (12.9)	203 (8.3)	204 (9.1)	140 (7.8)
>105.0	31 (1.0)	22 (0.9)	22 (1.0)	8 (0.4)

Late adolescents, fifteen- to nineteen-years-old, and adults were more likely to experience higher maximum recorded temperatures than other age groups (Table 17; Figure 8).

**Table 17. Maximum Recorded Temperature  $\geq 101^\circ\text{F}$  by Age Group, VSP, 1998**

Maximum Recorded Temperature	<1 N=72 n (%)	1 - 4 N=451 n (%)	5 - 9 N=940 n (%)	10 - 14 N=167 n (%)	15-19 N=55 n (%)	$\geq 20$ N=100 n (%)
101.0 to 102.9°F	6 (8.3)	66 (14.6)	165 (17.5)	33 (19.7)	14 (25.4)	18 (18.0)
103.0 to 104.9°F	7 (9.7)	36 (7.9)	60 (6.3)	14 (8.3)	7 (12.7)	16 (16.0)
$\geq 105^\circ\text{F}$	0	0	4 (0.4)	11 (5.9)	1 (1.8)	2 (2.0)
<b>Total</b>	<b>13 (18.0)</b>	<b>102 (22.6)</b>	<b>229 (24.3)</b>	<b>48 (28.7)</b>	<b>22 (40.0)</b>	<b>36 (36.0)</b>



### Medications Received During Varicella

Of the 1,785 verified cases in 1998, 104 (5.8%) were treated with acyclovir (Table 18). In 1998, the use of ibuprofen significantly increased from 6.0% in 1997 to 11.5% in 1998 ( $\chi^2=39$ ,  $p<0.005$ ).

**Table 18. Medications Received During Varicella, VSP, 1995 - 1998**

Type of Medication	1995 N = 2,934 n (%)	1996 N = 2,421 n (%)	1997 N = 2,219 n (%)	1998 N = 1,785 n (%)
Acyclovir	138 (4.7)	58 (2.4)	107 (4.8)	104 (5.8)
Antibiotics	354 (12.0)	181 (7.5)	187 (8.4)	144 (8.1)
Ibuprofen	114 (3.8)	155 (6.4)	133 (6.0)	206 (11.5)
Antipyretics	1,821 (62.1)	1,085 (44.8)	1,329 (59.9)	1,108 (62.1)
Antipruritics	1,415 (48.2)	895 (37.0)	1,092 (49.2)	776 (43.5)
Other Meds	225 (7.7)	184 (7.6)	73 (3.2)	51 (2.9)

Generally, the use of medication was more common among adults than among other age groups (Table 19).

**Table 19. Medications Received During Varicella by Age Group, VSP, 1998**

Medication	<1 N=72 n (%)	1 - 4 N=451 n (%)	5 - 9 N=940 n (%)	10 - 14 N=167 n (%)	15-19 N=55 n (%)	>19 N=100 n (%)	Total N=1,785 n (%)
Acyclovir	1 (1.4)	13 (2.9)	44 (4.7)	12 (7.2)	7 (12.7)	27 (27.0)	104 (5.8)
Antibiotics	10 (3.9)	41 (9.1)	57 (6.1)	16 (9.6)	8 (14.5)	12 (12.0)	144 (8.1)
Ibuprofen	5 (6.9)	49 (10.9)	101 (10.7)	27 (16.1)	5 (9.0)	19 (19.0)	206 (11.5)
Other Meds	2 (2.8)	8 (1.8)	24 (2.6)	4 (2.4)	0 (0)	13 (13.8)	51 (2.9)

### Hospitalizations

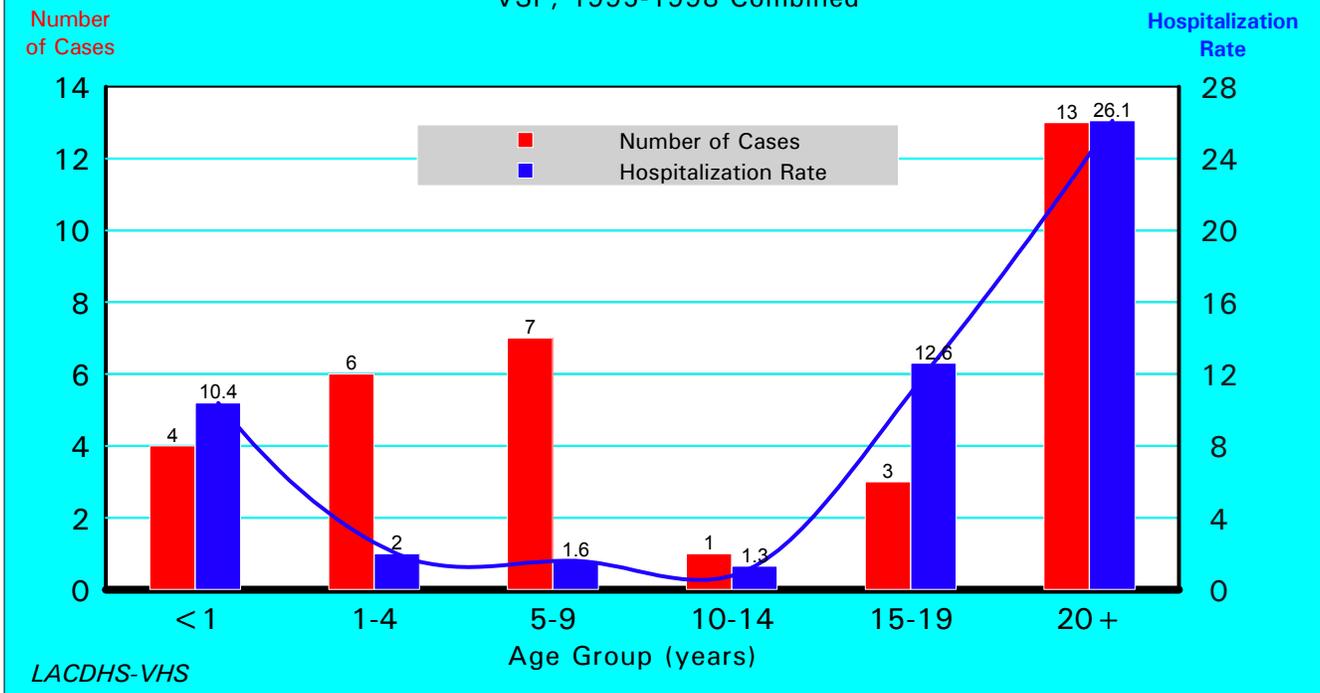
There were six hospitalized cases during 1998: a nine-year-old white female developed varicella on 3/18/98 and was hospitalized for 17 days from 3/25/98 to 4/10/98 with varicella encephalitis; a ten-year-old black female developed varicella on 5/3/98 and was hospitalized for eight days from 5/7 to 5/15 with abdominal necrotizing subcutaneous soft tissue infection involving Group A Streptococcus; a seven-year-old hispanic female developed varicella on 5/2/98 and was hospitalized for five days from 5/11 to 5/16 with acute appendicitis resulting in a perforated appendix and subsequent appendectomy; a 35 year old white male developed varicella on 5/22/98 and was hospitalized for one day from 5/25 to 5/26 with varicella pneumonia; a six-year-old white female developed varicella on 9/13/98 and was hospitalized for two days from 9/27 to 9/29 with new onset seizures (had family history of seizures); and a 28 year old black female developed varicella on 11/28/98 and was hospitalized for three days from 12/1/98 to 12/4/98 with pneumonia. No long term, severe sequelae was reported.

The rate of hospitalization per 1,000 cases of varicella in 1998 (3.4) is almost half the rate in 1997 (6.7). In 1997 the rate of hospitalizations was three times that of 1995 (2.0) and two times that of 1996 (2.9) (Table 20). The hospitalization rate over the years 1995-1998 displays a characteristic J-curve when considered by age group; the minimum rate 1.3/1,000 cases occurring among the 10- to 14-year olds and the maximum rate 26.1/1,000 cases occurring among adults (more than 19 years old) (Figure 9).

**Table 20. Age Distribution of Hospitalized Varicella Cases and Rates of Hospitalization, VSP, 1995 - 1998**

Age Group (years)	1995 N=2,934	1996 N=2,421	1997 N=2,219	1998 N=1,785	1995-1998 N=9,359	Hospitalization Rate/1,000
<1	0	2 (0.08)	2 (0.09)	0	4 (0.04)	10.4
1-4	1 (0.03)	1 (0.04)	4 (0.18)	0	6 (0.06)	2.0
5-9	3 (0.10)	0	1 (0.04)	3 (0.17)	7 (0.07)	1.6
10-14	0	0	0	1 (0.05)	1 (0.01)	1.3
15-19	0	2 (0.08)	1 (0.04)	0	3 (0.03)	12.6
20+	2 (0.07)	2 (0.08)	7 (0.31)	2 (0.11)	13 (0.13)	25.1
<b>Total</b>	<b>6 (0.2)</b>	<b>7 (0.3)</b>	<b>15 (0.7)</b>	<b>6 (0.3)</b>	<b>34 (0.4)</b>	<b>3.6</b>
<b>Rate/1,000 cases</b>	<b>2.0</b>	<b>2.9</b>	<b>6.7</b>	<b>3.4</b>	-----	-----
<b>Rate/100,000 pop.</b>	<b>2.0</b>	<b>2.6</b>	<b>5.0</b>	<b>2.0</b>	-----	-----

**Figure 9. Reported Cases of Hospitalized Varicella by Age Group and Cumulative Annual Hospitalization Rate per 1,000 Cases, VSP, 1995-1998 Combined**



Of the 34 cases hospitalized in the combined four years 1995-1998, 13 (38%) occurred among adults as follows: four (31%) were hospitalized for dehydration, four (31%) because of pneumonia and five (38%) for other reasons (Table 21).

**Table 21. Hospitalized Varicella Cases by Diagnosis and Age Group, VSP, 1995 - 1998 Combined Years**

Diagnosis in Hospitalized Cases	Age Group (years)						All Ages N=9,359
	<1 N=386	1 - 4 N=3,002	5 - 9 N=4,472	10 - 14 N=764	15-19 N=238	>19 N=497	
Septicemia Gp A Strep	0	0	1 (0.02)	0	0	0	1 (0.01)
Pneumonia	2 (0.5)	2 (0.07)	0	0	1 (0.4)	4 (0.8)	9 (0.1)
Meningitis/Encephalitis	0	0	1 (0.02)	0	1 (0.4)	1 (0.2)	3 (0.03)
Dehydration	0	0	1 (0.02)	0	0	4 (0.8)	5 (0.05)
Asthma Exacerbation	0	1 (0.03)	0	0	0	0	1 (0.01)
Skin Super Infections	2 (0.5)	1 (0.03)	0	0	0	0	3 (0.03)
Severe Abd.Pain (Hx: Transplant)	0	0	0	0	0	1(0.2)	1 (0.01)
Pre-term Labor	0	0	0	0	1 (0.4)	1(0.2)	2 (0.02)
Ocular Infection	0	1 (0.03)	0	0	0	1(0.2)	2 (0.02)
Thrombocytopenia/DIC	0	1 (0.03)	0	0	0	0	1 (0.01)
Lower Back Paralysis(Hx Lymphoma)	0	0	1(0.02)	0	0	0	1 (0.01)
Temperature (Hx Leukemia)	0	0	1(0.02)	0	0	0	1 (0.01)
R/O Osteomyelitis	0	0	0	0	0	1(0.2)	1 (0.01)
Surgery: Acute Appendicitis	0	0	1(0.02)	0	0	0	1 (0.01)
Surgery: Gp A Strep Soft Tissue Infection	0	0	0	1 (0.13)	0	0	1 (0.01)
New Onset Seizures	0	0	1(0.02)	0	0	0	1 (0.01)
<b>Total</b>	<b>4 (1.0)</b>	<b>6 (0.2)</b>	<b>7 (0.16)</b>	<b>1 (0.13)</b>	<b>3 (1.3)</b>	<b>13 (2.6)</b>	<b>34 (0.4)</b>

Of the total hospitalized cases, for children and adults equally, 21 (62%) had no known underlying disease (Table 22).

**Table 22. Pre-existing Conditions in Hospitalized Cases less than 20 years of age and 20 years of age and older, VSP, 1995 - 1998 Combined**

Pre-existing Condition	Hospitalized Cases		
	< 20 Years N (%)	≥ 20 Years N (%)	All Ages N (%)
Pre-existing Condition Reported	8 (38)	5 (38)	13 (38)
Malignancy	2	0	2
HIV/AIDS	0	0	0
Pregnancy - Preterm Labor	1	1	2
Juvenile Rheumatoid Arthritis	1	0	1
Multiple Sclerosis	0	1	1
Diabetes	0	1	1
Chronic Respiratory Condition (Asthma or COPD )	2	1	3
Steroid >20mg/day (S/P Kidney Transplant)	0	1	1
Seizure Disorder	2	0	2
No Pre-existing Condition Reported	13 (62)	8 (62)	21 (62)
<b>Total</b>	<b>21 (100)</b>	<b>13 (100)</b>	<b>34 (100)</b>

### Sequelae

No major, long term sequelae were reported in 1998.

## Varicella in Previously Vaccinated Persons

Of 1,785 verified cases of varicella in 1998, 89 (5.0%) cases occurred in persons who reported having received varicella vaccine (Table 23). Receipt of the varicella vaccine was confirmed for 72 (81%) of these cases in one of two ways: 1) interviewees checked the vaccine immunization record at the time of the telephone case interview, or 2) the patient's immunization record was reviewed by the medical office staff who administered the vaccine. Of the 89 cases reporting prior vaccination, 72 (81%) developed varicella 42 or more days after vaccination. Rash due to vaccine virus has been shown to occur up to 42 days after vaccination, thus cases that occur more than 42 days after vaccination provide a conservative estimate of breakthrough disease. Rash that occurs seven- to twenty-one days after vaccination could be vaccine-associated virus or could be due to wild-type virus that may have been incubating at the time of vaccination.

**Table 23. Varicella-Like Rash in Vaccine Recipients <42 days and >42 days after Vaccination, VSP, 1996 - 1998**

<b>Time of Rash Onset</b>	<b>1996 N=2,412 n (%)</b>	<b>1997 N=2,219 n (%)</b>	<b>1998 N=1,785 n (%)</b>
< 42 days of vaccination	12 (0.5)	20 (0.9)	13 (0.7)
> 42 days after vaccination	24 (1.0)	58 (2.6)	72 (4.0)
Unknown time period after vaccination	8 (0.3)	4 (0.2)	4 (0.2)
<b>Total</b>	<b>44 (1.8)</b>	<b>82 (3.7)<sup>1</sup></b>	<b>89 (5.0)<sup>2</sup></b>

<sup>1</sup>Of the 98 cases initially reporting receipt of varicella vaccine, 16.3% (16/98) did not actually receive the vaccine and were excluded based upon our contacting the reported vaccine administrator.

<sup>2</sup>Of the 156 cases initially reporting receipt of varicella vaccine, 42.9% (67/156) did not actually receive the vaccine and were excluded based upon our contacting the reported vaccine administrator.

A summary of varicella cases occurring 42 or more days after receipt of varicella vaccine is presented in Table 24 for 1996-1998. As expected, none of the cases that were previously vaccinated experienced more-than-average lesions and a majority (90%) had no complications (severity I).

**Table 24. Summary of Varicella Cases Occurring >42 days After Receipt of Varicella Vaccine, VSP, 1996 - 1998**

Age, Confirmation of Vaccination, Lesion Grading, Disease Severity, Illness Order, Source of Varicella Exposure and Source of Varicella Diagnosis	1996 N=24 n (%)	1997 N=58 n (%)	1998 N=72 n (%)
Age: 1 - 4 Years	12 (50.0)	29 (50.0)	31 (43.1)
5 - 9 Years	10 (41.6)	28 (48.3)	36 (50.0)
10 - 14 Years	1 (4.2)	1 (1.7)	2 (2.8)
15 - 19 Years	0	0	0
≥ 20 Years	1 (4.2)	0	3 (4.1)
Confirmed Receipt by: • Vaccine Record	N/A	5 (8.6)	22 (30.6)
• Healthcare Provider	N/A	46 (79.3)	38 (52.8)
• Recall only	24 (100)	7 (12.1)	12 (16.7)
Lesion Grading: • <Average	17 (70.8)	50 (86.2)	59 (81.9)
• Average	7 (29.2)	8 (13.8)	13 (18.1)
• >Average	0	0	0
Disease Severity: • Index 1	20 (83.3)	55 (94.8)	65 (90.3)
• Index 2	4 (16.7)	3 (5.2)	7 (9.7)
Illness Order: • Primary or Co-primary		43 (74)	57 (79.2)
• Secondary		15 (26)	15 (20.8)
Source of Varicella Diagnosis: • Healthcare Provider	8 (33.3)	23 (39.7)	31 (43.1)
• Parent/Self	16 (66.7)	34 (58.6)	40 (55.6)
• Other	0	1 (1.7)	1 (1.4)
Source of Varicella Exposure: • Known Source	21 (87.5)	50 (86.2)	59 (81.9)
• Unknown	3 (12.5)	8 (13.8)	13 (18.1)
Receipt of other Vaccines on the Same Day as Varicella Vaccine	2 (8.3)	19 (32.8)	22 (30.6)

Since 1995, considering only the 88% of breakthrough cases in 1997 and 1998 where vaccination history was confirmed through vaccine record or health care provider, on average, one out of 108 vaccinations resulted in a breakthrough case. The lowest percentage, 0.5% (one out of 200 vaccinations) of breakthrough cases occurred in those cases vaccinated in October; whereas, the highest percentage, 1.4% (one out of 70 vaccinations) of breakthrough cases occurred in those cases vaccinated in June (Table 25).

**Table 25. Breakthrough Cases as a Proportion of Monthly Vaccinations<sup>1</sup>, VSP, 1995 - 1998**

Month of Vaccination	Breakthrough Cases with confirmation of vaccine receipt <sup>2</sup>				Breakthrough Cases 1995-1998	Vaccinations by Month 1995-1998	Percentage of Breakthrough Cases
	1998	1997	1996	1995			
January	10	3	0	0	13	1,178	1.1
February	5	2	2	0	9	837	1.1
March	4	2	3	0	9	1,325	0.7
April	4	3	3	0	10	1,188	0.8
May	7	2	0	1	10	1,186	0.8
June	4	10	4	0	18	1,256	1.4
July	6	10	0	0	16	1,334	1.2
August	3	5	4	2	14	1,547	0.9
September	7	2	5	1	15	1,339	1.1
October	3	4	0	0	7	1,455	0.5
November	3	2	3	0	8	1,339	0.6
December	4	6	0	0	10	1,023	1.0
<b>Totals</b>	<b>60</b>	<b>51</b>	<b>24</b>	<b>4</b>	<b>139</b>	<b>15,007</b>	<b>0.93</b>

<sup>1</sup> A breakthrough case is defined as the onset of varicella occurring >42 days after vaccination.

<sup>2</sup> During 1995 and 1996, interview did not seek confirmation of vaccination date.

Interestingly, there were 63 breakthrough cases vaccinated during the hotter, four summer months (June through September) compared to 76 breakthrough cases vaccinated during the remaining eight cooler months (Jan.-May and Oct.-Dec.). The 1.2% (63/5,476) breakthrough cases vaccinated during the hotter months is significantly higher than the 0.8% (76/9,511) breakthrough cases vaccinated during the cooler months ( $\chi^2=4.7$ ,  $p<0.05$ ).

## Varicella Outbreaks

Defining an outbreak of varicella as five or more cases reported during a three-week period from schools and day cares/pre-schools, there were 72 outbreaks in 1998 involving 635 cases, an average of 8.8 cases/outbreak (Table 26). The number of outbreaks has steadily declined since 1995.

**Table 26. Varicella Outbreaks, VSP, 1995 - 1998**

Outbreak Variables	Years			
	1995	1996	1997	1998
Total number of outbreaks	119	96	86	72
Total Cases in outbreaks	1040	865	690	635
Average No. Of Cases/Outbreak	8.7	9.0	8.0	8.8

## Missed School and Missed Work

In 1998, cases missed school an average of six days and caretakers missed work an average of four days (Table 27).

**Table 27. Missed School and Work Days for Varicella Cases and Caretakers, VSP, 1997 - 1998**

Cases/ Caretakers Missing School or Work	Missed School and Work Days					
	1997			1998		
	No. of Cases Missing Work or School	No. of Days Missed	Mean/ Median Days Missed	No. of Cases Missing Work or School	No. of Days Missed	Mean/ Median Days Missed
Case Missed School	1,308	8,886	6.8/6.0	1,105	7,210	6.5/6.0
Case Missed Work	91	751	8.2/7.0	66	518	7.8/7.0
<b>Total for Cases</b>	<b>1,399</b>	<b>9,637</b>	<b>6.9/6.0</b>	<b>1,171</b>	<b>7,728</b>	<b>6.6/6.0</b>
Caretaker Missed School	28	105	3.7/3.0	27	98	3.6/2.0
Caretaker Missed Work	318	1,319	4.1/3.0	294	1,160	3.9/3.0
<b>Total for Caretakers</b>	<b>346</b>	<b>1,424</b>	<b>4.1/3.0</b>	<b>321</b>	<b>1,258</b>	<b>3.9/3.0</b>
<b>Combined Total</b>	<b>1,745</b>	<b>11,061</b>	<b>6.3/5.0</b>	<b>1,492</b>	<b>8,986</b>	<b>6.0/5.0</b>

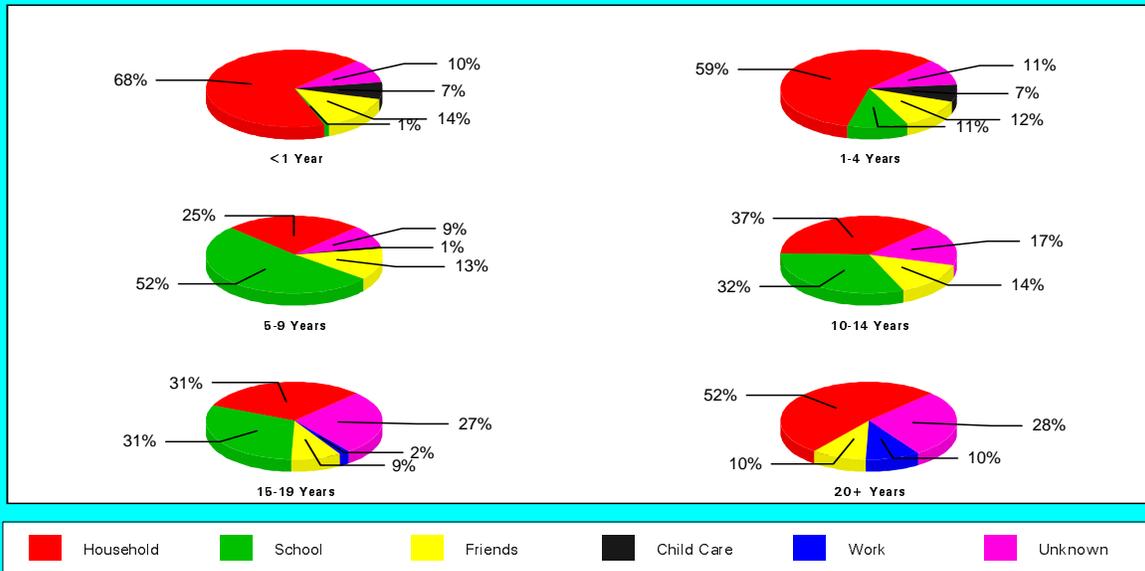
## Suspected Source of Varicella Infection

The suspected source of infection has had a consistent distribution throughout the project (Table 28). Figure 10 illustrates the suspected source of infection by age group.

**Table 28. Suspected Source of Varicella Infection by Year, VSP, 1995 - 1998**

Suspected Source of Infection	1995 N (%)	1996 N (%)	1997 N (%)	1998 N (%)
Household	1,211 (41.3)	1,018 (42.0)	897 (40.4)	680 (38.1)
School	1,008 (34.4)	826 (34.1)	724 (32.6)	603 (33.8)
Friends	293 (10.0)	277 (11.4)	271 (12.2)	230 (12.9)
Child Care	114 (3.9)	65 (2.7)	61 (2.7)	45 (2.5)
Work	22 (0.7)	8 (0.3)	13 (0.6)	11 (0.6)
Unknown	285 (9.7)	223 (9.2)	250 (11.3)	204 (11.4)
Other	1 (.03)	4 (0.2)	3 (0.1)	12 (0.7)
<b>Total</b>	<b>2,934 (100)</b>	<b>2,421 (100)</b>	<b>2,219 (100)</b>	<b>1,785 (100)</b>

Figure 10. Suspected Source of Varicella Infection by Age Group, VSP, 1998



LACDHS-VSP

## Source of Diagnosis

The source of varicella diagnosis showed a consistent distribution during 1995 and 1996. Beginning in 1997, when a case was seen by a physician in the office, varicella was credited as being diagnosed by a health care provider regardless of the fact that a case/caretaker initially diagnosed the illness; this accounts for the distribution change in 1997 and 1998 (Table 29).

**Table 29. Source of Varicella Diagnosis by Year, VSP, 1995 - 1998**

Source of Diagnosis	1995 N (%)	1996 N (%)	1997 N (%)	1998 N (%)
Parent/Guardian	2,267 (77.3)	1,873 (77.4)	1,426 (64.3)	1,095 (61.3)
Health Care Provider	478 (16.3)	392 (16.2)	665 (30.0)	649 (36.4)
Self	106 (3.6)	79 (3.3)	71 (3.2)	24 (1.3)
School Nurse	72 (2.5)	71 (2.9)	46 (2.1)	11 (0.6)
Child Care Provider	11 (0.4)	6 (0.2)	9 (0.4)	5 (0.3)
Other	0	0	2 (0.1)	1 (0.1)
<b>Total</b>	<b>2,934 (100)</b>	<b>2,421 (100)</b>	<b>2,219 (100)</b>	<b>1,785 (100)</b>

Telephone contact with a health care provider (without being seen in the office) was made by 369 (20.7) of cases in 1998 and 658 (36.8) were seen by a provider (Table 30).

**Table 30. Varicella Cases that Consulted a Health Care Provider by Telephone or by Office Visit, 1996 - 1998**

Consultation with Health Care Provider	1996 <sup>1</sup> N = 1,571	1997 N = 2,219	1998 N=1,785
Telephone Contact Only	345 (21.9)	412 (18.5)	369 (20.7)
Office Visit	499 (31.8)	806 (36.4)	658 (36.8)
Neither Called nor Visited	727 (46.3)	1,001 (45.1)	758 (42.5)

<sup>1</sup>Project staff began collecting this information in March 1996

## Source of Clinical Information

The source of clinical information showed a consistent distribution during 1995 and 1996. This distribution changed slightly in 1997 and 1998 because clinical information was collected from health care providers when the parent/guardian could not be reached and the case was known to be reported by a provider (Table 31).

**Table 31. Source of Clinical Information by Year, VSP, 1995 - 1998**

Source of Clinical Information	1995 N (%)	1996 N (%)	1997 N (%)	1998 N (%)
Parent/Guardian	2,717 (92.6)	2,272 (93.8)	1,980 (89.2)	1,606 (90.0)
Health Care Provider	1 (.03)	8 (0.3)	35 (1.6)	39 (2.2)
Self	105 (3.6)	64 (2.6)	100 (4.5)	77 (4.3)
School Nurse	2 (.06)	0	1 (.04)	0
Household Member	109 (3.7)	77 (3.2)	103 (4.6)	63 (3.5)
<b>Total</b>	<b>2,924 (100)</b>	<b>2,421 (100)</b>	<b>2,219 (100)</b>	<b>1,785 (100)</b>

## History of Previous Varicella

A history of previous varicella was reported by 9.5% (169/1785) of the cases during 1998, up 1.2% from the previous high in 1997 (Table 32). The average age at the time of initial infection was 4.1 years and the average age at the time of the second infection was 11.7 years.

**Table 32. History of Previous Varicella by Year, VSP, 1995 - 1998**

History of Previous Varicella	1995 N =2,034 n (%)	1996 N 2,421 n (%)	1997 N=2,219 n (%)	1998 N=1,785 n (%)
History of Previous Varicella	132 (4.5)	121 (5.0)	184 (8.3)	169 (9.5)
<b>Age at Onset (years)</b>	<b>mean (range)</b>	<b>mean(range)</b>	<b>mean (range)</b>	<b>mean (range)</b>
Initial Infection	3.2 (0-14)	3.3 (0-11)	3.7 (0-18)	4.1 (0-47)
Second Infection	11.4 (0-67)	9.9 (0-48)	11.0 (0-86)	11.7 (0-59)
Difference in Mean Age	8.2 -----	6.5 -----	7.3 -----	7.6 -----

## Household Cases

In 1998, there were 495 households with two-or-more cases of varicella (Table 33). Interestingly, about 70% of all cases reported occur within household clusters that comprised two-or-more individuals with varicella.

**Table 33. Households with Two or More Cases of Varicella, VSP, 1995 - 1998**

Household Description	1995 N=2,934 n (%)	1996 N=2,421 n (%)	1997 N = 2,219 n (%)	1998 N=1,785 n (%)
No. of Households	822	686	615	495
No. of Cases in Households	2,120 (72.3)	1,746 (72.1)	1,569 (70.7)	1,234 (69.1)
Average No. of Cases in Household	2.56	2.54	2.55	2.49

## Secondary Family Attack Rate

The secondary family attack rate (SFAR) is computed by dividing the number of secondary household cases by the number of susceptible household contacts at the time of the primary and co-primary cases. In 1998, the SFAR is 68.1% (556/816) for all ages and 75.1% (556/740) if we exclude susceptible adults (Table 34).

**Table 34. Secondary Family Attack Rate<sup>1</sup>, VSP, 1997 - 1998**

Household Contacts	1997	1998
Secondary Household Cases	716	556
Susceptible Household Contacts at the Time of the Primary/Co-primary Case <sup>2</sup>	1,060	816
Household Contacts with Unknown Susceptibility	123	47
Disease Induced Immunity	2823	2418
Vaccine Induced Immunity	85	81
<b>Secondary Family Attack Rate All Ages</b>	<b>67.5</b>	<b>68.1</b>
<b>Secondary Family Attack Rate &lt;1- to 19-year-olds</b>	<b>77.0</b>	<b>75.1</b>
<b>Secondary Family Attack Rate &lt;1- to 14-year-olds</b>	<b>78.3</b>	<b>76.2</b>

<sup>1</sup>Excludes those with unknown history.

<sup>2</sup>Co-primary cases are those cases occurring within ten or fewer days of the first case in the household

Of the 260 household contacts remaining susceptible in 1998, adults comprise 29.2% (76/260) the largest segment, possibly because they may falsely believe they are susceptible (Table 35).

**Table 35. Susceptible Household Members by Age Group, VSP, 1997 - 1998**

<b>Age Group (years) of Susceptible Household Members</b>	<b>1997 N (%)</b>	<b>1998 N (%)</b>
<1	35 (10.1)	33 (12.7)
1 - 4	82 (24.0)	65 (25.0)
5 - 9	56 (16.2)	60 (23.1)
10 - 14	26 (7.5)	16 (6.2)
15 - 19	15 (4.3)	10 (3.8)
> 20	130 (37.7)	76 (29.2)
<b>Total</b>	<b>344 (100)</b>	<b>260 (100)</b>